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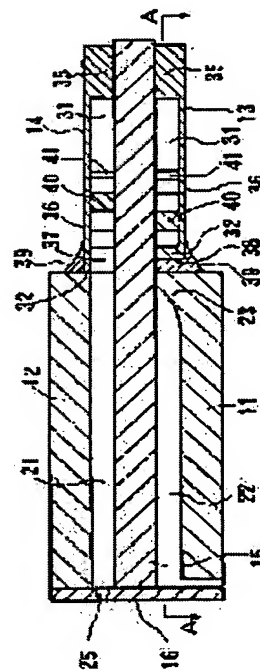
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(54) INK-JET HEAD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a manifold which can efficiently dampen a pressure wave to be generated when ink is jetted at ink channels although the manifold is small, can be easily formed by resin molding or the like and has a superior efficiency in removing bubbles.

SOLUTION: This manifold has an ink feed path 31 for supplying ink to a plurality of ink channels 21 formed therein. A bottom wall 36 of the manifold between a filter 40 in the ink feed path 31 and the ink channel 21 is formed of the same material as that of the other part of the wall integrally with and thinner than the other part of the wall to be elastically deformable by an ink pressure change. The thin bottom wall 36 is elastically deformed by the pressure wave generated to the ink channel 21 as the ink is jetted, so that the pressure wave is dampened. The manifolds 13 and 14 have front ends of the ink feed paths communicating with the ink channels and secured to substrates 11 and 12. Moreover, an open face of the ink feed path is covered with a cover plate 15 and secured to the cover plate 15.



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CLAIMS

[Claim(s)]

[Claim 1] The head body which has the actuator driven so that it may inject as a drop from the nozzle hole in which two or more channels which hold ink were formed in the alignment condition, and the ink in the channel concerned was prepared at the outlet edge of the channel concerned, While connecting with the inlet-port edge of two or more of said channels and extending in the alignment direction of two or more of said channels In an ink jet head equipped with the manifold with which the ink supply way which supplies the ink supplied from the ink source of supply to each inlet-port edge of two or more of said channels was formed the ingredient as other parts of a wall with some two or more same walls [at least] of said manifold which forms said ink supply way -- one -- and the ink jet head characterized by being formed by fluctuation of the pressure of said ink more thinly than other parts of a wall so that elastic deformation may be possible.

[Claim 2] It is the ink jet head characterized by carrying out extension formation in the direction of a field parallel to the field where said wall formed thinly is the extended direction of the inlet-port edge of two or more of said channels, and two or more channels aligned in the ink jet head according to claim 1.

[Claim 3] In an ink jet head according to claim 2 said manifold The wall which forms opening connected with the inlet-port edge of two or more of said channels, and the wall and the wall which counters across said ink supply way, The ink jet head characterized by forming thickly the wall of the pair which counters across said ink supply way in the alignment direction both ends of two or more of said channels so that it may have rigidity mostly, and for said wall formed thinly being surrounded by those walls, and arranging it.

[Claim 4] The wall located in inlet-port one end of two or more of said channels in an ink jet head according to claim 3 is an ink jet head characterized by having two or more openings connected with the inlet-port edge of each channel, respectively.

[Claim 5] It is the ink jet head which has in one the filter which said manifold sets two or more of said inlet-port edges and spacing of a channel, and counters in an ink jet head according to claim 2, and is characterized by locating said wall formed thinly between this filter and the inlet-port edge of said channel.

[Claim 6] It is the ink jet head characterized by carrying out the seal with the encapsulant with which it is supple between said walls formed thinly and said head bodies in an ink jet head according to claim 2.

[Claim 7] In an ink jet head according to claim 1 said head body The substrate with which said two or more channels opened the longitudinal direction wide, and were formed, It consists of covering plates which covered the open field of the longitudinal direction of two or more of the channels, and fixed to said substrate. It has opening which the ink supply way of said manifold connects with said channel at said substrate side, and is opened wide and formed in said covering plate side. Said manifold The ink jet head characterized by having connected said opening of an ink supply way with the channel of said substrate, having covered said open field with said covering plate, and having fixed.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the structure of the manifold which supplies ink to two or more channels which hold ink especially about the ink jet head which injects ink and records on recorded media.

[0002]

[Description of the Prior Art] An ink jet head gives a pressure alternatively to the ink held in two or more channels, and injects an ink droplet from the nozzle hole prepared in the outlet edge of the channel concerned. Ink is supplied to two or more channels through a manifold from an ink source of supply.

[0003] In the manifold directly connected with each channel, a pressure wave occurs with injection by the channel of arbitration. If injection is begun before the pressure wave reaches other channels through a manifold and it has declined, it will be superimposed with the injection pressure given to the channel, and effect and the so-called cross talk will arise in injection of an ink droplet.

[0004] The effect becomes large, so that the total number of channels is so large that the degree of integration of a channel is so large that a drive period is so short that the pressure which generates it is large. the timing which each channel injects also the same drive period -- it changes also with how.

[0005] Moreover, although putting a cap on a nozzle hole side, making negative pressure act, and removing the air bubbles in a channel or a manifold is performed with an ink jet head, since air bubbles cannot remain easily so that the volume is small in this case, a manifold has little poor injection by air bubbles. However, if the volume of a manifold is small, a pressure wave will tend to affect other channels as mentioned above.

[0006] For this reason, sticking the flexible film of a thin film on the wall surface of the ink supply way which counters the inlet-port edge of two or more channels, and making it decrease a pressure wave is variously proposed so that it may be indicated by JP,59-42964,A.

[0007]

[Problem(s) to be Solved by the Invention] a certain amount of [in order to do the activity to stick for components mark not only to to increase, but / in order to stick a flexible film on the member which constitutes an ink supply way from a configuration of a publication in the above-mentioned official report,] magnitude -- needed -- the volume of an ink supply way -- beyond the need -- **** -- it hears -- it became and removal effectiveness of air bubbles was worsened.

[0008] Moreover, in what prepares in a manifold the filter which consists of much projections along with two or more channels (for example, structure indicated by JP,6-312506,A), since a filter is in the location which counters the inlet-port edge of two or more channels, a flexible film cannot be arranged as mentioned above.

[0009] This invention offers the manifold of the configuration which can decrease efficiently the pressure wave which lessens components mark, and the volume of an ink supply way excels [pressure wave] in the removal nature of air bubbles small, and is generated [in / despite small / each channel], and can be easily fabricated by resin shaping etc.

[0010] Moreover, this invention offers the manifold which can also perform attenuation of a pressure wave, arranging a filter.

[0011]

[The means for solving a technical problem and an effect of the invention] Invention according to claim 1 made in order to attain the above-mentioned purpose The head body which has the actuator driven so that it may inject as a drop from the nozzle hole in which two or more channels which hold ink were formed in the alignment condition, and the ink in the channel concerned was prepared at the outlet edge of the channel concerned, While connecting with the inlet-port edge of two or more of said channels and extending in the alignment direction of two or more of said channels In an ink jet head equipped with the manifold with which the ink supply way which supplies the ink supplied from the ink source of supply to each inlet-port edge of two or more of said channels was formed the ingredient as other parts of a wall with some two or more same walls [at least] of said manifold which forms said ink supply way -- one -- and it is characterized by being formed by fluctuation of the pressure of said ink, more thinly than other parts of a wall so that elastic deformation may be possible.

[0012] Thus, by preparing a part for the thin wall in which elastic deformation is possible in one at the wall of a manifold, it can abolish making the volume of an ink supply way large beyond the need, and the removal nature of air bubbles can be raised. Moreover, it can fabricate by resin shaping etc. easily and components mark can be decreased.

[0013] In the ink jet head according to claim 1, extension formation of the invention according to claim 2 is carried out in the direction of a field parallel to the field where said wall formed thinly is the extended direction of the inlet-port edge of two or more of said channels, and two or more channels aligned. The pressure wave generated in each channel can be decreased by this in the place near the inlet-port edge of each channel, and a cross talk can be lessened despite small.

[0014] Invention according to claim 3 is set on an ink jet head according to claim 2. The wall which forms opening connected with the inlet-port edge of two or more of said channels, and the wall and the wall which counters across said ink supply way, The wall of the pair which counters across said ink supply way in the alignment direction both ends of two or more of said channels is thickly formed so that it may have rigidity mostly, and said wall formed thinly is mostly surrounded by those walls, and is arranged. Thus, in case a manifold is attached to a head body, it is easy to connect a manifold to the inlet-port edge of a channel by forming in a wall with rigidity opening connected with the inlet-port edge of a channel. Moreover, a manifold can fabricate easily the wall formed thinly by resin shaping etc. by surrounding mostly with a wall with rigidity, and the handling of mold goods is also easy a manifold.

[0015] Like [it is desirable and] invention according to claim 4, the edge of the manifold which the wall located in inlet-port one end of two or more of said channels connects to the inlet-port edge of a channel in the structure of being having two or more openings connected with the inlet-port edge of each channel, respectively, and having many channels does not become unstable, but it is easy to connect a manifold to the inlet-port edge of a channel as mentioned above.

[0016] Moreover, invention according to claim 5 has in one the filter with which said manifold sets two or more of said inlet-port edges and spacing of a channel, and counters in an ink jet head according to claim 2, and said wall formed thinly is located between this filter and the inlet-port edge of said channel. While this prevents a foreign matter and air bubbles invading with a filter to a channel, the pressure wave accompanying injection can be attenuated between a filter and the inlet-port edge of a channel.

[0017] Moreover, in the ink jet head according to claim 2, the seal of the invention according to claim 6 is carried out with the encapsulant with which between said walls formed thinly and said head bodies is supple. A pressure wave can be attenuated without the wall formed thinly having a motion restrained by this, when a manifold is attached to a head body.

[0018] Moreover, invention according to claim 7 is set on an ink jet head according to claim 1. The substrate with which said two or more channels opened the longitudinal direction wide, and said head body was formed, It consists of covering plates which covered the open field of the longitudinal direction of two or more of the channels, and fixed to said substrate. It had opening which the ink supply way of said manifold connects with said channel at said substrate side, and was opened wide and formed in said covering plate side, and said opening of an ink supply way is connected with the channel of said substrate, and said manifold covered said open field with said covering plate, and has

fixed. Thereby, a manifold can be constituted in the configuration which can be easily fabricated in the simple configuration in which the 2nd page was opened wide, i.e., resin shaping etc., and can be easily attached to a substrate and a covering plate by adhesion etc.

[0019]

[Embodiment of the Invention] Hereafter, 1 operation gestalt which materialized this invention is explained according to a drawing.

[0020] Drawing 1 is the perspective view showing the outline configuration of the ink jet head of this operation gestalt. The ink jet head consists of a head body 10 and manifold members 13 and 14.

[0021] The head body 10 consists of substrates 11 and 12 equipped with two or more channels, a covering plate 15, and a nozzle plate 16. Adhesion immobilization of each monotonous rectangle-like substrates 11 and 12 is carried out at the anterior part both sides of the monotonous rectangle-like covering plate 15. The covering plate 15 is extended rather than each substrates 11 and 12 at the back end side, and adhesion immobilization of each monotonous rectangle-like manifold members 13 and 14 is carried out at each corner section which the both-sides side of the extension of the covering plate 15 and the back end side of each substrates 11 and 12 accomplish. Adhesion immobilization of the plate-like nozzle plate 16 is carried out in the front end side of each substrates 11 and 12 and the covering plate 15.

[0022] Drawing 2 is a decomposition perspective view explaining the structure of the head body 10. Since the structure of two substrates 11 and 12 is almost the same, one substrate 11 is explained. A substrate 11 consists of electrostrictive ceramics material 11a and 11b of two sheets which carried out the laminating. Both the ceramic material 11a and 11b is the direction of board thickness, respectively, and polarization is mutually carried out to hard flow, it is crossed to both the ceramic material 11a and 11b, and two or more parallel slots are formed in the alignment condition. This slot consists of an ink channel 21 which holds ink alternately, and a dummy channel 22 located in the both ends of an ink channel train between the ink channel. Opening is carried out to the both ends of a substrate 11, and it is formed in them, and connects with the nozzle hole 24 which ended in the nozzle plate 16 in the front end, and the ink channel 21 is connected to the ink supply way later mentioned in a manifold 13 in the back end. It starts in the back end, and is blockaded with a wall 23, and the dummy channel 22 is connected to an ink supply way. The open field of the longitudinal direction of both the channels 21 and 22 is covered with the covering plate 15. Therefore, although ink is supplied to the ink channel 21 from the manifold member 13, the inside of the dummy channel 22 is space.

[0023] The electrode layers 27 and 28 are formed in the both-sides side of a septum 24 which separates both the channels 21 and 22 so that it may expand to drawing 3 and may be shown. If the electrode layer 27 in the ink channel 21 to which ink injection tends to be carried out is grounded and a forward electrical potential difference is impressed to the electrode layer 28 of both the outsides of this ink channel, the electric field of the direction of polarization and the direction of a right angle will be generated in the septum 24 of electrostrictive ceramics. In each part of the upper and lower sides of a septum 24, since the direction of polarization is reverse, each part of the upper and lower sides of a septum 24 shear-strains to hard flow, respectively. Consequently, the volume of the ink channel 21 is expanded in the example of drawing 3. If impression of the after electrical potential difference is stopped, a septum 24 will return, a pressure will be applied to ink, and an ink droplet will be injected from a nozzle hole 25. In addition, the volume of the ink channel 21 can be reduced and ink can also be made to inject by shear strain of a septum 24.

[0024] Where the ink supply way 31 for supplying ink to each ink channel 21 is wide opened to the covering plate 15 side, it has the manifold members 13 and 14. The walls 32, 33, 34, and 35 around the ink supply way 31 are thick in the depth direction of the ink supply way 31, and are formed in it with rigidity, and the bottom wall (or head-lining wall) 36 of the ink supply way 31 is formed it is sufficiently thin and possible [elastic deformation] as compared with those walls. Each walls 32, 33, 34, 35, and 36 of the manifold members 13 and 14 are fabricated by one with a synthetic-resin ingredient, for example, Pori Sall John, polypropylene, etc. A synthetic-resin ingredient has ink-proof nature, and if a fluidity is good in order to fabricate the thin wall 36 moreover, many kinds of things can be used for it. 100 micrometers or less of thickness of the thin bottom wall 36 are preferably formed in 30-40 micrometers so that it may deform easily by the pressure wave by ink

injection.

[0025] The wall 32 of ink channel 21 inlet-port one end of the manifold members 13 and 14 had the opening 37 corresponding to the inlet-port edge of each ink channel, and has connected the ink supply way 31 to each ink channel 21 through the opening 37. Between each opening 37 of the wall 32, a slot 38 is formed, and where the back end of the head substrate 11 is contacted in a wall 32, the contact face-to-face is filled up with adhesives-cum-the encapsulant 39 through a slot 38, and adhesion immobilization is carried out in it. As shown in drawing 5, since adhesives-cum-this encapsulant 39 is piled also in the outside of the thin wall 36, it is desirable, the ingredient, for example, the silicone etc., etc. which has flexibility which does not bar the elastic deformation of that thin bottom wall 36 so that it may mention later. Adhesives-cum-the encapsulant on which the covering plate 15 and walls 32, 33, 34, and 35 are pasted up is easy to be the thing of the type to harden.

[0026] Between the wall 32 of ink channel 21 inlet-port one end of the manifold members 13 and 14, and it and the wall 35 which counters, two or more pillar-shaped projections 40 and two or more ink guidance ribs 41 which constitute a filter are formed in a bottom wall 36 and one, and the feed holes 42 connected to the end of the ink supply way 31 with an ink source of supply are formed. The pillar-shaped projection 40 has prevented that make two or more trains, and set spacing in the direction of a train of an ink channel 21 inlet-port edge, and it is located in it from opening 37, make spacing during each pillar-shaped projection 40 smaller than the width of face of opening 37 and the ink channel 21, and the foreign matter in ink and air bubbles flow into the ink channel 21. Moreover, from a wall 35 and the pillar-shaped projection 40, two or more ink guidance ribs 41 set spacing, respectively, are located, and they are guided so that the ink which flowed from feed holes 42 may be distributed to all the ink channels 21 almost equally.

[0027] In addition, 1-2 ink channels of the both ends of ink channel 21 train have not countered with the pillar-shaped projection 40 which constitutes a filter, as shown in drawing 4. In order that air bubbles may tend to pile up [tend] in the both ends of the ink supply way 31, this is because air bubbles and a foreign matter can be removed efficiently, without receiving resistance with a filter from the ink channel of both ends, when performing Flushing (ink is made to inject from an ink channel, without performing record actuation), and purging (negative pressure is made for all the nozzle holes 25 to act on a wrap cap, and suction discharge of the ink is carried out) for these air bubbles. The supply way which supplies ink to the ink channel, and the supply way which supplies ink to the ink channel which carries out ink injection for record are divided with the electric shielding wall 43.

[0028] At the time of record actuation, the ink which flowed from feed holes 42 is guided at the guidance rib 41, is distributed towards two or more ink channels 21 for record actuation, and is led to the ink channel 21 from opening 37 through between the pillar-shaped projections 40 which constitute a filter. When the septum 24 of an ink channel drives alternatively as mentioned above, an ink droplet is injected from a nozzle hole 25. Although the pressure wave accompanying this injection is transmitted also in the ink supply way 31 in a manifold member, it is rare for the thin wall 36 between the filter section 40 and the inlet-port edge of an ink channel to be able to carry out elastic deformation, to be able to attenuate this pressure wave effectively, and to affect the ink in other ink channels.

[0029] Since the thin wall 36 approaches the train of two or more channels, and is prolonged covering the overall length of the train and formed in the direction of a field parallel to the field of a channel, it can attenuate a pressure wave effectively also to injection actuation by which ink channel. Thus, since the thin bottom wall 36 by the side of an ink channel acts on attenuation of a pressure wave effectively rather than the filter section 40, the bottom wall 36 between the filter section 40 and a wall 35 has little need of forming thinly.

[0030] Moreover, since the bottom wall 36 which carries out elastic deformation can be formed in the location near the ink channel 21 at one, the need for securing the location for sticking a thin film like before etc. does not have to be lost, and it is not necessary to make a manifold member large beyond the need, consequently the volume of an ink supply way can be made as small as possible, and the removal effectiveness of the air bubbles by purge etc. can be improved.

[0031] A wall and the filter section 40 including the thin wall 36 can be easily fabricated in the

configuration of the above-mentioned manifold members 13 and 14 with a resin ingredient etc. Moreover, as for the wall formed thinly, the shaping can also make it still easier by having surrounded mostly with the wall with rigidity, and the handling of mold goods also becomes easy. Furthermore, the edge of the manifold linked to the inlet-port edge of a channel does not become unstable, but it is easy to connect a manifold to the inlet-port edge of a channel by having the wall rigidity located in inlet-port one end of two or more channels.

[0032] In addition, this invention is not limited to the above-mentioned operation gestalt, may be changed as follows, and can acquire an operation and effectiveness equivalent to the above-mentioned operation gestalt even in such a case.

[0033] (1) Although the above-mentioned operation gestalt used electrostrictive ceramics for injection actuation of ink, it may be applied to the ink jet head of other methods (for example, thermal jet method using a heater element etc.).

[0034] (2) although two substrates 11 and 12 have been arranged to the symmetry with the above-mentioned operation gestalt at the both sides of the covering plate 15 -- one substrate -- even if -- it is good and three or more substrates may be used.

[0035] (3) Although the dummy channel 22 is formed in the both sides of each ink channel 21, the dummy channel 22 is excluded and you may make it only the ink channel 21 adjoin with the above-mentioned operation gestalt.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The perspective view showing the outline configuration of the ink jet head of 1 operation gestalt which materialized this invention.

[Drawing 2] The decomposition perspective view explaining the configuration of the head body of an ink jet head.

[Drawing 3] The cross-sectional view of a head body.

[Drawing 4] The A-A line sectional view which is drawing 5 with drawing of longitudinal section of an ink jet head.

[Drawing 5] The B-B line sectional view of drawing 4.

[Description of Notations]

10 -- Head body

11 12 -- Substrate

13 14 -- Manifold member

15 -- Covering plate

22 -- Ink channel

31 -- Ink supply way

36 -- Thin wall

37 -- Opening

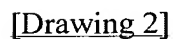
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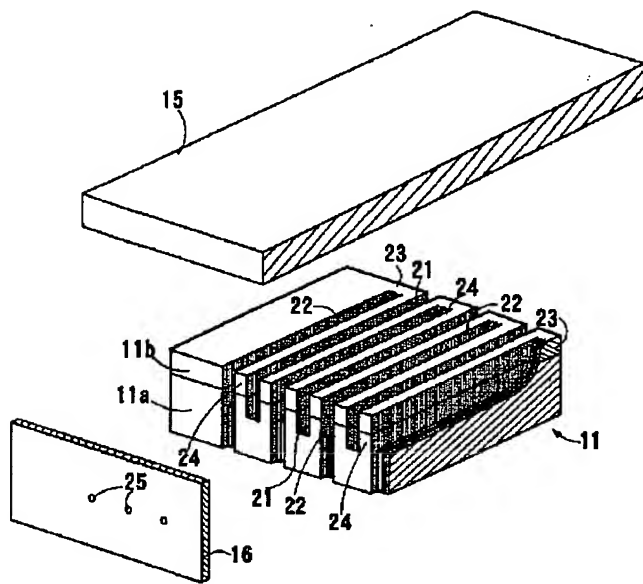
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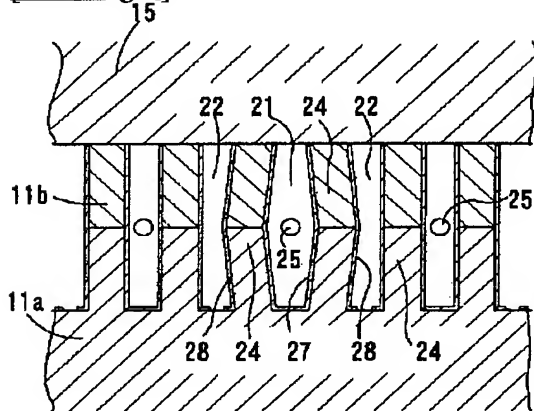
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[Drawing 5]

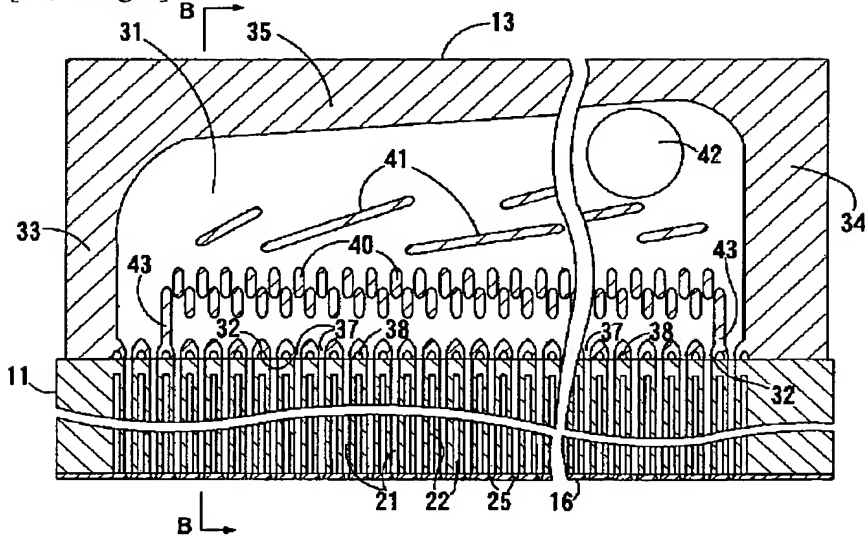




[Drawing 3]



[Drawing 4]



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